repeated in six to eight hours if necessary. Mepacrine sulphionate (atebrin musonate) may also be given intravenously, but the margin of safety with this drug is low, and the intramuscular route is to be preferred, 200 mg. being injected into each buttock (total dosage 400 mg.). Good results have also been claimed with chloroquine and camoquin given intramuscularly. Should none of the above-mentioned drugs be available, quinine sulphate 15 to 30 gr. (1 to 2 g.) may be given per rectum, mixed with starch paste thin enough to run through a rectal catheter. The drug is rapidly absorbed by this route. As soon as the patient is able to take drugs by mouth all further medication should be administered orally. The action of proguanil is not sufficiently rapid to warrant the use of this drug in cases of extreme urgency.

Blood transfusion may be indicated in pernicious malaria accompanied by grave anaemia. Vomiting, if persistent, may be relieved by intravenous injections of 5% glucose in 200 to 400 ml. of normal saline, repeated if necessary, and supplemented by 1 mg. of thiamin hydrochloride for each 25 g. of glucose.

Summary

The relative merits of the various specific drugs now available for the treatment of malignant tertian malaria are discussed in detail.

Emphasis is laid on the importance of differentiating this disease from a number of others which it may simulate very closely, and on the fact that infections with different geographical strains of *P. falciparum* may vary widely in their response to treatment with the same antimalarial drug.

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The control of venereal diseases in Germany was one of the most arduous tasks which faced the Occupation Authorities after the war. In an article which appeared in a recent number of the *Epidemiological and Vital Statistics Report*, Dr. T. Guthe, Chief of the Venereal-Disease Section of WHO, surveyed the situation in Germany from 1945 to 1948, and gave a detailed account of the result of measures taken in the various zones during that period. According to the *Chronicle of the World Health Organization* the venereal-disease problem in Germany is not due to the presence of occupying troops and displaced persons, although this view is often expressed by Germans. Venereal diseases increased steadily in Germany, as in other countries, as a consequence of war conditions: displacement of civilian, industrial, and military populations; social, economic, and political upheavals; disruption of family life; increase of promiscuity and prostitution. Surveys carried out at Frankfurt-on-Main and Hamburg show that venereal diseases caused considerable ravages among the civilian population during the war. The increase in venereal infections which took place during the war in civilian and military populations in the Reich was also observed in several countries occupied by or allied with Germany, as recorded in Denmark, Finland, France, Greece, Norway, and some of the Balkan countries.

CONTINUOUS CAUDAL ANALGESIA IN OBSTETRICS, SURGERY, AND THERAPEUTICS*

BY

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The extradural administration of local analgesic solutions through the sacral hiatus via an indwelling malleable needle or an indwelling small-bore catheter is designated as continuous caudal analgesia. The basic technique of single-injection caudal analgesia produced by a cocaine solution was independently introduced in Paris in 1901 by J. A. Sicard and F. Cathelin. As new and safer local analgesic agents were developed, modifications of the technique greatly extended the anatomical application of this method to nerves of pain in, first, the sacral plexus, then the lumbar region, and, finally, to the low and mid-thoracic regions. Even though caudal analgesia provided a high percentage of successes in rectal surgery and in urology, it was so undependable in obstetrics that Stoeckel abandoned it shortly after he introduced it in 1909. Dr. Hans Schlimpert, of the Freiburg Clinic, developed a satisfactory technique of caudal analgesia in obstetrics, which was used in combination with *Dämmerschlaf*. His tour of American clinics in 1913 stimulated the application of this method in a few centres.

In America during the next three decades the single-injection technique of caudal analgesia was enthusiastically utilized but ultimately rejected by all except one of its outstanding advocates. The one exception was my own revered professor of anaesthetics, Dr. John S. Lundy, of the Mayo Clinic. It was Lundy who instructed me in my first applications of this technique. It was he who inspired me with the thought that all pain can be conquered if the physician will master the science of applying the principles of pharmacology and anaesthesiology to the specific anatomical pathways of pain.

Thus in 1940 and 1941, when uncontrolled obstetric pain on the one hand, and profound and prolonged obstetric narcosis on the other, demanded a more satisfactory and safer method of anaesthesia for the parturient woman and her baby, Southworth, Edwards, and I surveyed the problem to determine the specific nerve pathways involved. We found that the classic researches of John G. P. Cleland, of McGill, had delineated the afferent pain pathways of the contracting uterus as passing through the eleventh and twelfth thoracic nerves. We substantiated the postulates of Sir Henry Head, of England, that pain of the dilating cervix was transmitted through the second, third, and fourth sacral nerves. We concurred with DeLee, Greenhill, and Tucker that the pain of perineal distension was transmitted through the pudendal, perineal, and haemorrhoidal nerves. We soon found that the single-injection technique of Sicard and Cathelin when extended to the tenth thoracic segment in the peridural space would totally relieve temporarily the pain of labour or the pain of delivery.

Merely by combining the principles of caudal analgesia with the continuous spinal anaesthesia principle of Lemmon, of Philadelphia, and the continuous aortic lumbar anaesthesia of Abrucl, of Rumania, we were able to fashion a

*Read in opening a discussion in the Section of Anaesthetics at the Annual Meeting of the British Medical Association, Harrogate, 1949.

new technique: continuous caudal analgesia. Thus, for the first time it was possible to control the pain of the major portion of active labour and that of delivery with the same technique. Happily, such a technique at the same time removed from the baby the burden of transplacental narcosis. It has been described in the following manner by Dr. J. P. Greenhill in his last edition of *DeLee's Obstetrics*: "There is no doubt that when this procedure is properly performed without any misstep there is no more satisfactory and pleasant type of analgesia in obstetrics."

It is obvious, therefore, that continuous caudal analgesia represents the combined efforts and brilliant researches of two distinguished French physicians, a Canadian obstetrician and anatomist, an English neurologist, German, Swiss, and American pharmacologists, a Mayo Clinic anaesthesiologist, a Philadelphia surgeon, and a Rumanian physician, who have placed in our hands the principles, the drugs, and the anatomical knowledge necessary to develop a single technique that is capable of relieving pain for surgery, obstetrics, and therapeutics from the xiphoid to the toes for an hour, a day, or a week.

Among the architects of this technique it would be impossible to overlook the substantial contributions of that venerable metallurgist and artisan, Oscar Schwidetzky, of the Becton Dickinson Company, who has fashioned with ingenuity the simple and compact instrumentarium.

Use in Obstetrics

The outstanding advantage of continuous caudal analgesia in this field is seen in a baby delivered without trauma, who cries and breathes and saturates his blood cells with oxygen without stimulation. This factor of baby protection is unequalled in any form of seminarcosis, narcosis, or general anaesthesia. It can be approximated only by saddle-block spinal anaesthesia and local analgesia. After a personal experience with this technique in 12,000 cases, and after training 2,000 physicians, who have reported its use in 260 scientific papers in eight languages for 600,000 deliveries, I am convinced that it offers effective and humane relief, without suggestion or hypnotism, to normal and handicapped mothers for the delivery of normal and premature babies. This opinion is shared by the 80 American obstetricians who have each managed more than a thousand deliveries under continuous caudal analgesia.

The leading United States hospitals which utilize this technique in substantial numbers are: the Beth-El Hospital in Brooklyn with 12,000 cases; the Stanford University Hospital in San Francisco with 8,000 cases; the Philadelphia Lying-in Hospital with 5,000 cases; the Syracuse University Hospital with 10,000 cases; the United States Marine Hospital in New York with 2,000 cases; the Johns Hopkins Hospital with 2,000 cases; the hospitals of Memphis, Tennessee, with 5,000 cases; the Barnes Hospital in St. Louis with 3,000 cases; and many others where nurses or doctors, trained on a 24-hour team basis, utilize this technique correctly, with the medical safeguards which protect the altered body processes in a psychological environment which maintains the patient's happiness and emotional tranquillity.

The new adjuncts of this order provided for our patients, who so often are mentally alert and who are enthralled in observing with a clear eye the actual birth of their babies, are: air-conditioning, bedside libraries, interior decorating in pastel colours, landscapes in oils and water colours, television, and well-controlled and well-selected melody and symphony of transcribed music. All or none of these pleasant interludes are provided at the direction

and prescription of the attending obstetrician and of the patient herself.

Continuous caudal analgesia has returned to womankind the privilege of being present in comfort for the baby's birth. Its judicious use provides the safest labour and delivery available for patients with cardiac disease, nephritis, pulmonary disease, metabolic disease, and toxæmia. More than a score of outstanding obstetricians have declared continuous caudal analgesia to be the physician's best invitation to a premature baby for survival. In documenting this statement the Washington University Maternity Hospital from St. Louis, in a study of 591 premature deliveries (Table I), reported recently to the American

TABLE I.—Results of 591 Premature Deliveries Among 7,650 Non-conductions, 2,500 Caudal, and 500 Saddle-block Deliveries (July 10, 1945, to December 27, 1948)

Weight Group	Total No. in Group	Intraneatal Deaths	Post-natal Deaths	Neonatal Deaths	Total Deaths	Infant Mortality
Non-conduction Group						
2,500–2,001 g.	218	5	3	9	17	7.8%
2,000–1,501 g.	75	5	1	11	17	22.7%
1,500–1,001 g.	34	6	1	11	18	52.9%
1,000–500 g.	20	10	5	5	20	100.0%
	347	26	10	36	72	20.8%
Conduction Group						
2,500–2,001 g.	138	1	0	4	5	3.6%
2,000–1,501 g.	65	0	1	3	4	6.2%
1,500–1,001 g.	28	0	0	7	7	25.0%
1,000–500 g.	13	1	0	9	10	76.9%
	244	2	1	23	26	10.7%

Incidence of premature deliveries in the non-conduction group is 4.9% (35 stillborn macerated infants included), and in the conduction group 8% (5 stillborn macerated infants included).

Medical Association that "the labours protected by conduction anaesthesia (three-quarters under caudal and one-quarter under saddle-block) show an infant mortality that was consistently at least 100% lower than that in the non-conduction group."

My experience during a three-year study, 1942–5, in the Philadelphia Lying-in Hospital coincided substantially with the Washington University report (Table II). It is my belief that if delicate premature infants, who comprise approximately 10% of obstetrical deliveries, are protected by this technique the mature babies might receive the same relative benefit.

TABLE II.—Neonatal Mortality per 1,000 Live Births Among Full-term and Premature Infants in the Caudal and Control Groups

	Premature Infants	Full-term Infants
Control group	227.3	6.4
Caudal group	131.7	3.0

The Philadelphia and Memphis studies show that mothers in all age groups, but particularly in the early and late extremes of the child-bearing period, benefit from this form of management (Tables III and IV).

Use in Breech Delivery.—One of my first students, Dr. Roy Nicodemus, director of obstetrics of a large Pennsylvania hospital, six years ago began the routine use of continuous caudal analgesia. In 4,000 consecutive deliveries with this technique he has managed 186 breech deliveries with an uncorrected infant mortality of stillbirths and neonatal deaths of 1.2%. He then analysed the previous 186 breech deliveries in which he had used general anaesthesia and sedation and found an uncorrected infant mortality of 6.9%. In a paper soon to be published in the American literature he concludes that this method thus lends itself favourably to the safe management of breech delivery.

TABLE III.—*Stillbirths and Neonatal Mortality per 1,000 Live Births Among Mothers of Different Ages in the Caudal and Control Groups. Philadelphia Study*

	Age of Mother		
	Under 25	25-29	30 and Over
Control group	47.8	30.6	59.0
Caudal group	14.2	13.6	35.4

TABLE IV.—*Stillbirths and Neonatal Mortality (Under 1 Week) per 1,000 Live Births Among Negro and White Mothers of Different Ages. Memphis Study, 1946*

	Age of Mother		
	Under 25	25-29	30 and Over
General	45.1	159.1	131.1
Spinal	70.8	46.5	60.0
Caudal	32.0	40.0	52.6

Use in Therapeutics

Continuous caudal analgesia through its control of nerve impulses to blood vessels and extremities and to viscera of pelvis and abdomen can be utilized as a major therapeutic measure. Its most promising field of usefulness lies in the following diseases: (1) the control and treatment of eclampsia, (2) oliguria and anuria on the basis of reflex renal ischaemia, (3) post-surgical abdominal distension and paralytic ileus, (4) arterial emboli of abdomen and lower extremities, (5) thrombophlebitis and phlebothrombosis, (6) prognosis of and indications for sympathectomy in essential hypertension, (7) the prolonged relief of post-operative or traumatic pain, and (8) sciatica and neuralgias of the lower extremities and pelvic girdle.

In 24 consecutive cases of eclampsia managed by me in the John Gaston Hospital in Memphis, Tennessee, there was a reduction in both the systolic and the diastolic blood pressures, and there was definite clinical improvement and elimination of convulsions in each case so treated. These 24 cases form part of a series of 76 that I have managed with these techniques in which there were only three maternal deaths. The infant mortality in this series was 12%. It is my contention that the substitution of continuous conduction anaesthesia for narcotic and magnesium sulphate therapy in eclampsia provides the most effective method of blood pressure and convulsion control, and permits the highest incidence of live births in this group.

A related type of vasomotor crisis is seen in the terminal coma with convulsion associated with uraemia and glomerulonephritis. An 11-year-old negro girl had a persistently mounting blood pressure, with ultimate heart failure and pulmonary oedema in spite of sedation with "aminophylline" and intravenous magnesium sulphate therapy, and even phlebotomy of 200 ml. At the point of *exodus letalis* continuous caudal analgesia in fifteen minutes, according to the indicated dosage schedule, reduced the blood pressure from 215/185 to 140/90, with the prompt restoration of consciousness, improvement of urinary outflow, and control of the pulmonary and cardiac emergencies.

Continuous caudal analgesia has presented us with an avenue of therapeutic inhibition of critical neurogenic and angiospastic mechanisms. Upon this concept lies a new horizon for the medical profession which may supersede the use of this technique in the control of pain. Its companion is the anatomically related continuous lumbar peridural analgesia as designed by us.

As continuous caudal analgesia exerts its most profound influence from below upward over the spinal nerves, so does lumbar peridural analgesia exert its influence from

above downward. Either of the techniques presents the exact anatomical avenue for anaesthesia or for therapy of the organ or segment involved.

Use in Surgery

Continuous caudal analgesia is the safest and most effective technique at our disposal for operative and post-operative pain relief in haemorrhoidectomy, prostatectomy, and for operations on the perineum. By extending the levels of nerve block into the low thoracic plexus, adequate anaesthesia is produced for hernioplasty, appendectomy, and caesarean section. We have utilized this technique in the latter three operations in more than 2,000 patients without any anaesthetic mortality. Now with continuous peridural lumbar analgesia at our disposal upper-abdominal and low-thoracic operations are more widely being managed by the extradural approach. In our hands this technique has been particularly useful for the control of pain in long orthopaedic operations which require serial x-ray confirmations of position and alignment of dismembered bony fragments. Even the aged and debilitated patients withstand hip-nailing operations and the like with the minimum of shock under this technique.

Drugs and Techniques.—Both techniques of the mal-leable needle and the indwelling catheter have been thoroughly described in the literature. The most practical recent improvement has been the substitution of the economical plastic catheter. We have extended dosage schedules and optimum concentrations of procaine, "metycaine," "pontocaine," "nupercaine," and, more recently, the safe and effective local analgesic from Sweden that is being introduced as "xylocaine."

Purely on an anatomical basis we can effectively block the afferent nerve pathways from the respective organs with the indicated dosage:

Haemorrhoids and rectum	10 ml.
Prostate and perineum	20 ml.
Bladder and uterus	30 ml.
Appendix and intestine	40 ml.
Stomach, spleen, and gall-bladder	50 ml.

Continuous caudal analgesia can be intensified to a nerve block comparable with that obtained with spinal anaesthesia by a second dose, according to the scale indicated, about fifteen minutes after the first. The duration of the analgesia is entirely dependent upon the number of serial doses that are used.

Complications, Dangers, and Contraindications

Of utmost importance is a thorough knowledge of prevention of complications, amelioration of the hazards, and strict observance of the contraindications.

The most common complication is the slow or arrested labour that develops from two factors: (a) too early institution of the technique before progressive dilatation of the cervix to 5 cm.; and (b) overdosage extending the level of analgesia into mid-thoracic and upper-thoracic levels, thus interfering with the motor innervation of the uterus.

Fortunately, with the continuous method instituted through the indwelling small-gauge catheter the analgesia may be permitted to wear off and then be withheld until there is evidence of established and progressive labour. The analgesia should not be persistently maintained in the event of retarded labour unless a therapeutic advantage to either mother or baby is seen.

In my clinical experience, which is substantiated by both the Lorand and Reynolds tocodynamometer studies, approximately one-third of the labours are retarded to a

varying degree with standard dosage and segmental block ; one-third are unaffected ; and one-third actually suggest a clinical improvement in progress and dilatation. The second stage is definitely prolonged, since the compulsion desire to push and the abdominal somatic tone are both diminished. The usual primipara with the normal-size infant in the United States is delivered by election with episiotomy and outlet forceps. Most multiparae may be encouraged to deliver spontaneously.

The second highest complication incidence is the development of maternal hypotension, especially in the dorsal supine position. In large measure this is mechanical, through the production of a bloodless phlebotomy into the dilated vessels of the lower extremity. In some 5,000 carefully analysed cases this complication presented itself in 22% of the cases. The usual range of systolic reduction was from 120 to 90 mm. Hg.

The incidence may be greatly decreased by the prophylactic use of the vasopressor drug in all individuals with normal or low blood pressure, and in the maintenance of proper hydration, especially during hot weather. Hypotension may be combated by: (a) intravenous vasopressor drugs in minute 10-mg. doses of ephedrine or the equivalent *pro renata*, (b) intravenous fluids containing glucose, (c) high atmospheres of inhaled oxygen, and (d) autotransfusions by raising the lower extremities to right-angles with the long body axis to produce a gravity return of the venous blood. In cases with severe varicose veins elastic stockings should be applied.

In our experience the mother tolerated extremes of hypotension, even a systolic pressure of 60 mm. Hg, better than the baby, who on occasion developed a bradycardia when a maternal systolic pressure below 80 mm. Hg was neglected for five minutes or longer. Even under these circumstances we have delivered babies with normal arterial and venous cord blood oxygen, provided the mother at the time was inhaling rich oxygen atmospheres. A few cases of loss of foetal life *in utero* or shortly thereafter have emphasized to several observers the importance of maintaining maternal blood pressure.

A third complication formerly greatly feared is the inadvertent spinal or subarachnoid anaesthesia of overwhelming proportions with the usual caudal dosages. The institution of the test dose and the ten-minute wait before proceeding and the institution of a low, safe, continuous spinal or saddle-block analgesia for these cases through intentional election have served to minimize this hazard. Inadvertent puncture of the spinal canal, with the usual insertion of a needle 6 cm. into the canal, has occurred under supervision only about once for each 500 cases. In some we elect to abandon the procedure, but in others we prefer to institute continuous spinal analgesia with usually one-thirtieth to one-fifteenth of the recommended dose. Careful aspiration of the indwelling caudal needle before insertion of the catheter reveals spinal fluid in almost all the small fraction of cases with low-lying durae.

Another complication that was formerly greatly feared is infection about the site of injection. With careful cleanliness and antisepsis and gloved technique, the incidence of infection is now about 1 in 1,000 caudal deliveries. The majority of these are simple pin-point pustules from the needle puncture. About one case of cellulitis or peridural infection occurs in each 5,000 deliveries under continuous caudal analgesia. With the prompt institution of the antibiotic drugs this type of infection can often be controlled. Nevertheless, with proper technique and proper care of equipment it can be prevented. In the control of eclampsia

we have maintained continuous caudal analgesia for periods of one week without producing any demonstrable nerve irritation.

The fifth type of complication is that due to individual toxicity to the various local analgesics. It is characterized by immediate and persistent nausea and vomiting accentuated by each dose of the local analgesic, by tachycardia, by dizziness, and by hyperirritability. In nearly every instance we have achieved satisfactory results by the substitution of another local analgesic, such as procaine or pontocaine for metycaine, or vice versa.

The contraindications are as follows: (1) inadequate training or skill on the part of the operator ; (2) sub-standard home or hospital conditions which do not provide the safeguards of available oxygen, vasopressor drugs, intravenous fluids, and proper asepsis ; (3) local infection or skin irritation at the site of needle puncture ; (4) gross abnormalities obliterating sacral hiatus or deformities of the vertebral column, which preclude the proper distribution of the anaesthetic agent ; (5) central nervous system disease or disease of the vertebral column, such as tuberculosis, syphilis, etc. ; and (6) previous laminectomy.

Summary

In America continuous caudal analgesia has been used for more than 600,000 deliveries. It has proved its capacity for relieving pain in surgery, obstetrics, and therapeutics from the xiphoid to the toes for an hour, a day, or a week. Its proper application eliminates transplacental narcosis and pharmacological retardation of vital baby reflexes.

Through such a mechanism of labour the premature baby is spared drug depression and the traumas attendant upon delivery through an unrelaxed birth canal.

More than 200 medical papers in eight languages have concluded that infant mortality and morbidity have been reduced with continuous caudal analgesia.

Under its management the third stage of labour is shortened and post-partum blood loss approaches the minimum. Post-partum complications are conspicuous by their absence.

Mothers with toxæmia, heart disease, and respiratory and metabolic infirmities are spared most of the stress and strain of labour.

It has been used in the control and treatment of eclampsia in more than 100 cases, with a maternal mortality below 5% and an infant mortality below 15%. Dieckmann, of Chicago, has described it as the outstanding advance in the treatment of this disease of our present decade. Greenhill, of Chicago, has declared: "There is no more satisfactory and pleasant type of analgesia in obstetrics."

The indwelling-catheter method of administration makes it simple and easy to apply for prolonged periods.

In proper dilutions all of the standard local analgesic agents in volume sufficient to block the 16 afferent nerve pain pathways from the uterus provide complete maternal comfort in 85 to 92% of cases.

The complications have been sharply delineated and methods of their prevention and treatment are presented.

The incidence of forceps deliveries is increased. In those clinics where this is considered to be undesirable this technique will still prove to be invaluable in permitting slow deliberate forceps delivery of the parturient woman arrested in the second stage of labour.

The technique has been used successfully for all types of rectal, perineal, and lower abdominal operations and for orthopaedic procedures on the lower extremities.

In the treatment of thrombophlebitis it provides easy access to the sympathetic nerves, which Leriche blocked through the paravertebral approaches. In America continuous caudal analgesia with a single-needle catheter technique is replacing the four needle insertions of lumbar paravertebral block.

Other therapeutic applications in treating arterial emboli, reflex anuria, abdominal distension, and vascular insufficiency have been described.

Continuous caudal analgesia has been determined of great value in the prognosis of sympathectomy for essential hypertension.

It opens a new avenue for the prolonged control of post-operative and intractable pain in terminal carcinomatosis.

Finally, the medical profession and I personally express our gratitude to our European colleagues who in 1901, after careful researches, made possible this medical technique which it has been my privilege to extend into these various applications.

SOME OBSERVATIONS ON PULMONARY TUBERCULOSIS IN THE NIGERIAN AFRICAN

BY

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Pulmonary tuberculosis is moderately common amongst the Nigerians, but, though cases now report more often to the hospitals for treatment, there is no conclusive evidence that its incidence is rising significantly. Anticipated measures for the control of the disease in Nigeria are likely to meet with little success unless close account is taken of its particular characteristics in the African, and it is hoped that the following observations may serve to stress some of its features. The series of cases, though consecutive, is admittedly very small, but supports the conclusions drawn from a large number of additional cases seen during the last eleven years, but in which observations and investigations were less complete.

The peculiarly virulent nature of pulmonary tuberculosis in the African is still sometimes attributed to a relatively recent introduction of the infection by the European to a country and people not hitherto exposed to it—a so-called virgin soil. It is probable, however, that the disease was introduced long before the advent of Europeans in significant numbers, possibly from the North and Near East by the old trans-Sahara trade routes. Conceptions of the importance of a virgin soil seem to imply that an inherited immunity can be established as a result of several generations of exposure to infection, but the example of the American negro furnishes no evidence in support of this supposition or in favour of a possible progressive genetic elimination of the highly susceptible. Though improvement in education, economic status, and standard of living may do much to mitigate the severity of the disease amongst the population as a whole, it seems that the violence of the disease in the African must be explained on a basis of his inborn constitutional peculiarities.

The common impression in Nigeria is that pulmonary tuberculosis in the African is not amenable to treatment and is invariably fatal. That the outlook is not so hopeless as this Davies (1946) has shown as a result of twenty years' work in Tanganyika. He points out that by the time a patient presents himself voluntarily for treatment his disease, so rapid is its advance in the African, is already hopeless of cure, and such indeed is the experience in Nigeria. Apart from the obvious necessity for education of the public and for improved living conditions, isolation of the open case is a prime essential. Davies stresses that for this purpose, and for the detection of cases early enough for effective treatment, sanatoria working as isolated units

are no more effective than the existing general hospitals, for both are dependent on the voluntary attendance of patients. Only by the institution of travelling teams equipped for clinical examination, mass skin tests, and miniature radiography, designed to detect the early case and the susceptible individual, and of spaced bush dispensaries based on regional sanatoria, can satisfactory results be anticipated.

Incidence of Tuberculous Infection

Skin Tests.—Table I shows the results of Mantoux tests with 1 in 5,000 old tuberculin on 93 hospital in-patients, chiefly Northern Nigerians, not exhibiting any demonstrable

TABLE I

Age Group	0-9	10-19	20-29	30-39	40-49	50 and Over
Positive	0	6	13	7	13	8
Negative	3	3	9	7	9	5
Proportion positive ..	0%	32%	59%	50%	59%	61%

TABLE II

Age Group	0-4	5-9	10-14	15-19	20-29	30-39	40-49	50 and over
Positive	1	2	2	3	8	3	4	4
Negative	4	5	1	1	2	1	1	1
Proportion positive ..	20%	29%	67%	75%	80%	75%	80%	80%

TABLE III

Negative	Weakly Positive	Strongly Positive	Total Positive
32	10	51	61 (65.6%)

tuberculous lesion. Table II gives the Mantoux results with 1 in 500 old tuberculin in 43 similar in-patients, while Table III shows the findings with 1 in 500 old tuberculin in 93 male scholars of a Government secondary school, all Southern Nigerians aged between 13 and 16 years. It is evident from these results that 65% of the more urban sections of the community in their mid-teens and 80% of those in the 20-29 age group and onwards have experienced a tuberculous infection.

Necropsy Evidence.—In a series of 90 consecutive routine necropsies carried out on the cadavers of patients who had died in one hospital of conditions other than tuberculous a search was made for latent or healed tuberculous foci. Almost all of the lesions so encountered were sent to the Lagos laboratory for microscopical confirmation. The results are given in Table IV.

TABLE IV

Age Group:	0-9	10-19	20-29	30-39	40-49	50 and over	Total
Pulmonary focus ..	0	0	0	1	1	1	19 (21.1%)
Hilar or broncho-mediastinal gland focus ..	0	0	3	1	2	1	
Pulmonary + hilar gland foci ..	0	0	0	1	1	1	
Abdominal gland focus ..	0	0	2	1	1	0	
Pulmonary, hilar gland, and abdominal gland foci ..	0	0	1	1	0	0	71 (78.9%)
No tuberculous focus ..	6	6	18	13	20	8	
Proportion with tuberculous foci ..	0%	0%	25%	28%	20%	27%	

It is observed that of these 90 cadavers 19 (21.1%) showed easily demonstrable healed or latent tuberculous foci. The employment of specialized methods would